MANIPUR PUBLIC SERVICE COMMISSION

Advt. No. 04/2021
Dated 29/11/2021

No. 7/6/2019-MPSC(DR): Applications are invited for direct recruitment to the following posts in Forensic Science Laboratory, Pangei under Police Department, Manipur.

Sl. No.	Name of Post	Pay Scale	Class & Service	Total post
1	Scientific Officer (Cyber)	Rs. 9,300-34,800/- with GP Rs. 5,400/-	I & Civil	1-UR
2.	Scientific Assistant (Cyber)	Rs. 9,300-34,800/- with GP Rs. 4,300/-	II & Civil	2-UR
3.	Scientific Assistant (Chemistry)	Rs. 9,300-34,800/- with GP Rs. 4,300/-	II & Civil	2-UR
4.	Scientific Assistant (Photography)	Rs. 9,300-34,800/- with GP Rs. 4,300/-	II & Civil	1-UR

2. Centre of Examination: Imphal.

3. Period of probation: 2(two) years

4. Eligibility Conditions:-

(i) The candidate must be a citizen of India.

(ii) The candidate must be able to speak Manipuri or any of the Tribal dialect of Manipur.

(iii) The candidate must be a permanent resident of Manipur provided that a candidate whose parent or any of his/her ancestors in his/her direct lineage are permanent resident of the State, with proper documentary proof.

(IV) **Age Limit:** A candidate shall be **38 years or below** as on **20/12/2021** (Upper age limit is relaxable for Government servants appointed under the Government of Manipur to the extent of the period of continuous service put in the post/service).

Note: There will be no age relaxation for SC/ST & OBC candidates as there is no reserved post reserved for SC/ST & OBC category for this examination.

(V) **Educational and other Qualifications as on 20/12/2021:**

Sl. No.	Name of Post	Qualification(s)
1	**Scientific Officer (Cyber)**	**Essential:** MCA/ M.Sc IT/ M. Sc. Computer Science with Physics as one of the subjects in Bachelor Degree or Degree in Computer Science and Engineering or M.Sc. Forensic Science with Physics as one of the subjects in Bachelor Degree and P.G. Diploma in Computer Application or M.Sc. Physics with P.G. Diploma in Computer Application from a recognised University/ Institute. **Desirable:** (i) Research experience in Cyber Forensic in a recognised University/ Institute. (ii) Experience of working in a Forensic Science Laboratory.
2	**Scientific Assistant (Cyber)**	**Essential:** MCA/ M.Sc IT/ M. Sc. Computer Science with Physics as one of the subjects in Bachelor Degree or Degree in Computer Science and Engineering or M.Sc. Forensic Science with Physics as one of the subjects in Bachelor Degree and P.G. Diploma in Computer Application or M.Sc. Physics with P.G. Diploma in Computer Application from a recognised University/ Institute. **Desirable**: Experience of research in Cyber Forensic in a recognised University/Institute.

3	**Scientific Assistant (Chemistry)**	**Essential:** M.Sc. in Chemistry/ Biochemistry/ Forensic Science (with Chemistry in Bachelor's degree) from a recognised University. **Desirable:** Previous experience in a Forensic Science Lab. recognized by State/ Central Govt.
4	**Scientific Assistant (Photography)**	M.Sc. in Forensic Science (with Physics as one of the subjects in Bachelor degree)/ Physics form a recognised University/ Institute.

(VI) Choice of post with preference:

A candidate may apply for more than one post depending upon eligibility but preference must be given in the relevant boxes. **Preference once filled will not be permitted to change** in future.

Name of post applied	Preference No.
Scientific Officer (Cyber)	
Scientific Assistant (Cyber)	
Scientific Assistant (Chemistry)	
Scientific Assistant (Photography)	

5. STARTING AND CLOSING DATE FOR SUBMISSION OF ONLINE APPLICATION:

The online application should be applied at www.empsconline.gov.in w.e.f. **29/11/2021** upto 12:00 midnight of **20/12/2021** after which the link will be disabled. Submission of application in any other mode will not be entertained.

6. MODE OF SUBMITTING APPLICATIONS:

(I) Before applying for the post, candidates should register as per "ONE TIME REGISTRATION" scheme through the official website of Manipur Public Service Commission i.e. www.empsconline.gov.in .

Candidates need to upload full details before applying any post. Once the ONE TIME REGISTRATION is completed, candidates need to fill up and complete his/her PROFILE by submitting all the relevant details. This includes:

1. Upload Passport Photograph, signature as proof etc.
2. Add Personal information.
3. Add Parents Information.
4. Add Educational information
5. Add Language and Physical Nature.
6. Add Experience.

Once the above mentioned processes are completed, only then the candidate can apply for the post.

(II) Candidates who are already registered user of the portal may directly login and apply.

(III) Candidates are responsible to ensure correctness of the personal information and secrecy of password and they shall keep in mind the user ID and the mobile number for further communication. Applications which are submitted not in accordance with the instructions will be summarily rejected. Documents to prove qualifications, experience, age, community etc. have to be produced as and when called for by the Commission. Any variance in the documents submitted online and physical documents will be summarily rejected.

Fee: Candidates are required to pay a fee of Rs. 500/- for General & OBC and for Rs. 250/- for SC & ST by using net banking, Visa/Master Card/Debit Card through www.empsconline.gov.in portal. No fee is payable for DAP (Differently Abled Candidates)

Note 1: Candidates should note that payment of examination fee can be made only through online mode as mentioned above. Payment of fee through any other mode is neither valid nor acceptable. Application submitted without prescribed fee/mode shall be summarily rejected.

Note 2: Fee once paid shall not be refunded under any circumstances nor can the fee be held in reserve for any other examination or selection.

Note 3: For the Applicants in whose case payments details have not been received from the bank, they will be treated as fictitious payment cases and their applications will be rejected in the first instance. A list of such applicants shall be made available on the Commissions website after the last date of online application. On receipt of documentary proof, genuine fee payment cases will be considered and their applications will be revived, if they are otherwise eligible.

In case of any problem being faced in the processing of the online application, drop a mail at empsconlineissues@gmail.com along with your phone number and problem being faced from your registered user mail ID.

7. All candidates in service other than casual or muster roll will be required to submit/upload the **"NO OBJECTION CERTIFICATE"** duly issued by the concerned **Department/Authority** for appearing in the examination.

8. The eligible candidates shall be issued an **e-Admission Certificate.** The e-Admission certificate will be made available in the MPSC website (www.empsconline.gov.in) for downloading by the candidates. No admission Certificate will be issued from MPSC Office or sent by post.

9. No candidate will be admitted to the Examination unless he/she holds the above mentioned e-Admission Certificate and any one of the Identity Document mentioned above.

10. The decision of the Commission as to the eligibility or otherwise of a candidate for admission to the Examination shall be final. If on verification at any time before, during or after the Examination/ Interview, it is found that a candidate does not fulfil any of the eligibility condition, his/her candidature for the Examination will be cancelled by the Commission.

11. **Withdrawal of applications:** No request for withdrawal of candidature received from a candidate after he/she has submitted his/her application will be entertained under any circumstances.

12. The answers to the MCQ will be uploaded within a day of conclusion of the examination. Any complaints regarding the correctness of the answers to the MCQ should be filled with relevant explanation and proof within 7 days.

13. The Commission reserves the right to amend this notification in parts or to the whole.

14. **Scheme & Syllabus of Examination:**

A. Written Examination (MCQ Type); 450 marks

i). **Paper I: General Studies; 100 marks for 100 Questions; Duration- 1 Hrs**

a) General English (Grammatical Knowledge) - 10 marks
b) Current Affairs (State, National & International events) - 10 marks
c) General Science - 30 marks
d) Forensic Science -15 marks
e) General Mental Ability (Analytical and reasoning, Numerical abilities) – 35 marks

ii). **Paper II: Optional Paper; 200 Marks for 200 Questions; Duration- 2 Hrs**

Candidates have to choose any one of the following Optional papers **as per qualification prescribed for each post.**

a) Physics
b) Chemistry
c) Forensic Science and
d) Computer Science and Applications

The syllabi of Physics, Chemistry, Forensic Science and Computer Science and Applications for Optional papers are enclosed as Annexure A/1, A/2, A/3 and A/4 respectively.

The syllabi of Physics and Chemistry are as in Manipur Civil Services Combined Competitive Examination, 2019 and those for Forensic Science and Computer Science and Application are based on those of UGC NET.

iii). **Paper III: Additional Paper; 150 Marks for 150 Questions; Duration- 1 Hrs & 30 mins.**

A candidate has to choose any one of the following subject as additional paper depending upon the posts applied for and their qualifications **which will decide the applicable post**.

a) Forensic Chemistry.
b) Cyber Forensic.
c) Forensic Photography.

The syllabi of Forensic Chemistry, Cyber Forensic and Forensic Photography for Additional papers are enclosed as Annexure B/1, B/2 and B/3 respectively.

The syllabi for Forensic Chemistry, Cyber Forensics and Forensic Photography are mainly based on the syllabus of LNJN-National Institute of Criminology and Forensic Science, Delhi.

B. Interview/ Viva-voce- 50 Marks

*** Combination of Optional Papers and Additional Papers according to post(s):**

Sl. No.	Name of Post(s)	Combination of Optional Paper(s) and Additional Paper
1	Scientific Officer (Cyber) and Scientific Assistant (Cyber)	Physics and Cyber Forensic **or** Forensic Science and Cyber Forensic **or** Computer Science & Application and Cyber Forensic
2	Scientific Assistant (Chemistry)	Chemistry and Forensic Chemistry **or** Forensic Science and Forensic Chemistry
3	Scientific Assistant (Photography)	Physics and Forensic Photography **or** Forensic Science and Forensic Photography
Candidates are advised to carefully choose Optional Paper and Additional paper according to the post applied. Choosing of incorrect combination of Optional paper and Additional paper against the post applied will results to rejection of application. No appeal will be entertained in this regard.		

Note:

I). Each correct answer in MCQs will earn 1 mark and there will be and **a negative marking 0.5 marks** for wrong answer.

II). The number of candidates to be called for interview will be 3 (three) times the number of vacancies advertised among the candidates who secure 40% marks in the written examination (i.e. 180 marks out of 450 marks in written examination). Candidates securing equal marks with the last candidate in written examination will also be called for interview.

III). The final merit list of the candidates would be based on the total of the written and Interview marks. In case more than one candidate has the same total marks then the candidate possessing Desirable qualification will be ranked higher. In case, the candidates' total marks are equal and they all possess Desirable qualification, the candidate securing higher marks in Additional Paper will be ranked higher. In case, the candidates' total marks are equal, possess Desirable qualification and marks of Additional Paper are same then, the older (in age) candidate will be ranked higher.

IV). **A candidate found to be furnishing incorrect information to the Commission, suppressing information, violating instructions, adopting various unfair means in the Examination like impersonation, cheating, etc is liable to be disqualified and/or debarred from writing MPSC Examinations as decided by the Commission.**

15. Schedule of written Examination will be notified later on.

27/11/2021

(S.N. Vaiphei)
Registrar,
Manipur Public Service Commission

Copy to:

1. Secretary to Governor of Manipur.
2. Secretary to Chief Minister, Manipur.
3. Staff Officer to the Chief Secretary, Govt. of Manipur.
4. P.S. to Chairman, Member MPSC.
5. Special Secretary (Home), Govt. of Manipur.
6. Joint Secretary, Controller of Examination, MPSC.
7. Director DIPR, Imphal, with a request for publication in local dailies as news item.
8. Director, Forensic Science Laboratory, Pangei, Manipur.
9. Director/IT, Manipur for uploading in Manipur Government website.
10. Station Director, Doordarshan Kendra Imphal, Porompat, Imphal
    He is requested to announce it as news item.
11. Station Director, All Indian Radio, Imphal. He is requested to announce it in all local dialects as news item.
12. The OSD (Legal), Under Secretary, MPSC.
13. Cubeten Technologies Pvt. Ltd. for necessary action.
14. Official Website of MPSC (www.mpscmanipur.gov.in)
15. Notice board, MPSC.
16. Guard File.

Physics Syllabus

Section – I

1.(a) Mechanics of Particles. Laws of motion; conservation of energy and momentum, applications to rotating frames, centripetal and Coriolis accelerations; Motion under a central force; Conservation of angular momentum, Kepler's laws; Fields and potentials; Gravitational field and potential due to spherical bodies, Gauss and Poisson equations, gravitational self-energy; Two-body problem; Reduced mass; Rutherford scattering; Centre of mass an laboratory reference frames.

b). Mechanics of Rigid Bodies: System of particles; Centre of mass, angular momentum, equations of motion; Conservation theorems for energy, momentum and angular momentum; Elastic and inelastic collisions; Rigid body; Degrees of freedom, Euler's theorem, angular velocity, angular momentum, moments of inertia, theorems of parallel and perpendicular axes, equation of motion for rotation; Molecular rotations (as rigid bodies); Di and tri-atomic molecules; Precessional motion; top, gyroscope.

c). Mechanics of Continuous Media: Elasticity, Hooke's law and elastic constants of isotropic solids and their inter-relation; Streamline (Laminar) flow, viscosity, Poiseuille's equation, Bernoulli's equation, Stokes' law and applications.

d)Special Relativity: Michelson-Morley experiment and its implications; Lorentz transformations-length contraction, time dilation, addition of relativistic velocities, aberration and Doppler effect, mass-energy relation, simple applications to a decay process; Four dimensional momentum vector; Covariance of equations of physics.

2. WAVES AND OPTICS:

a. Waves: Simple harmonic motion, damped oscillation, forced oscillation and resonance; Beats; Stationary waves in a string; Pulses and wave packets; Phase and group velocities; Reflection and Refraction from Huygens' principle.

b. Geometrical Optics: Laws of reflection and refraction from Fermat's principle ; Matrix method in paraxial optics-thin lens formula, nodal planes, system of two thin lenses, chromatic and spherical aberrations.

c. Interference: Interference of light-Young's experiment, Newton's rings, interference by thin films, Michelson interferometer; Multiple beam interference and Fabry Perot interferometer.

d. Diffraction: Fraunhofer diffraction-single slit, double slit, diffraction grating, resolving power; Diffraction by a circular aperture and the Airy pattern; Fresnel diffraction: half-period zones and zone plates, circular aperture.

e. Polarization and Modern Optics: Production and detection of linearly and circularly polarized light; Double refraction, quarter wave plate; Optical activity; Principles of fibre optics, attenuation; Pulse dispersion in step index and parabolic index fibres; Material dispersion, single mode fibres; Lasers-Einstein A and B coefficients; Ruby and He-Ne lasers; Characteristics of laser light-spatial and temporal coherence; Focusing of laser beams; Three-level scheme for laser operation; Holography and simple applications.

3. Electricity and Magnetism:

a. Electrostatics and Magnetostatics: Laplace and Poisson equations in electrostatics and their applications; Energy of a system of charges, multipole expansion of scalar potential; Method of images1 and its applications; Potential and field due to a dipole, force and torque on a dipole in an external field; Dielectrics, polarization; Solutions to boundary-value problems-conducting and dielectric spheres in a uniform electric field; Magnetic shell, uniformly magnetized sphere; Ferromagnetic materials, hysteresis, energy loss.

b. Current Electricity: Kirchhoff's laws and their applications; Biot-Savart law, Ampere's law, Faraday's law, Lenz' law; Self-and mutual-inductances; Mean and r m s values in AC circuits; DC and AC circuits with R, L and C components; Series and parallel resonances; Quality factor; Principle of transformer.

4. Electromagnetic Waves and Blackbody Radiation: Displacement current and Maxwell's equations; Wave equations in vacuum, Poynting theorem; Vector and scalar potentials; Electromagnetic field tensor, covariance of Maxwell's equations; Wave equations in isotropic dielectrics, reflection and refraction at the boundary of two dielectrics; Fresnel's relations; Total internal reflection; Normal and anomalous dispersion; Rayleigh scattering; Blackbody radiation and Planck's radiation law, Stefan - Boltzmann law, Wien's displacement law and Rayleigh-Jeans' law.

5.Thermal and Statistical Physics:

a. Thermodynamics: Laws of thermodynamics, reversible and irreversible processes, entropy; Isothermal, adiabatic, isobaric, isochoric processes and entropy changes; Otto and Diesel engines, Gibbs' phase rule and chemical potential; van der Waals equation of state of a real gas, critical constants; Maxwell-Boltzman distribution of molecular velocities, transport phenomena, equipartition and virial theorems; Dulong-Petit , Einstein, and Debye's theories of specific heat of solids; Maxwell relations and applications ; Clausius- Clapeyron equation; Adiabatic demagnetisation, Joule-Kelvin effect and liquefaction of gases.

b. Statistical Physics: Macro and micro states, statistical distributions, Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac distributions, applications to specific heat of gases and blackbody radiation; Concept of negative temperatures.

Section - II

1. Quantum Mechanics:

Wave-particle dualitiy; Schroedinger equation and expectation values; Uncertainty principle; Solutions of the one-dimensional Schroedinger equation for a free particle (Gaussian wave-packet), particle in a box, particle in a finite well, linear harmonic oscillator; Reflection and transmission by a step potential and by a rectangular barrier; Particle in a three dimensional box, density of states, free electron theory of metals; Angular momentum; Hydrogen atom; Spin half particles, properties of Pauli spin matrices.

2. Atomic and Molecular Physics:

Stern-Gerlach experiment, electron spin, fine structure of hydrogen atom; L-S coupling, J-J coupling; Spectroscopic notation of atomic states; Zeeman effect; FrankCondon principle and applications; Elementary theory of rotational, vibrational and electronic spectra of diatomic molecules; Raman effect and molecular structure; Laser Raman spectroscopy; Importance of neutral hydrogen atom, molecular hydrogen and molecular hydrogen ion in astronomy; Fluorescence and Phosphorescence; Elementary theory and applications of NMR and EPR; Elementary ideas about Lamb shift and its significance.

3. Nuclear and Particle Physics:

Basic nuclear properties-size, binding energy, angular momentum, parity, magnetic moment; Semi-empirical mass formula and applications, mass parabolas; Ground state of deuteron, magnetic moment and non-central forces; Meson theory of nuclear forces; Salient features of nuclear forces;Shell model of the nucleus - successes and limitations; Violation of parity in beta decay; Gamma decay and internal conversion; Elementary ideas about Mossbauer spectroscopy; Q-value of nuclear reactions; Nuclear fission and fusion, energy production in stars; Nuclear reactors. Classification of elementary particles and their interactions ; Conservation laws ; Quark structure of hadrons; Field quanta of

electroweak and strong interactions; Elementary ideas about unification of forces; Physics of neutrinos.

4. Solid State Physics, Devices and Electronics:

Crystalline and amorphous structure of matter; Different crystal systems, space groups; Methods of determination of crystal structure; X-ray diffraction, scanning and transmission electron microscopies; Band theory of solids - conductors, insulators and semiconductors; Thermal properties of solids, specific heat, Debye theory; Magnetism: dia, para and ferromagnetism; Elements of superconductivity, Meissner effect, Josephson junctions and applications; Elementary ideas about high temperature superconductivity. Intrinsic and extrinsic semiconductors; p-n-p and n-p-n transistors; Amplifiers and oscillators; Op-amps; FET, JFET and MOSFET; Digital electronics-Boolean identities, De Morgan's laws, logic gates and truth tables; Simple logic circuits; Thermistors, solar cells; Fundamentals of microprocessors and digital computers.

Chemistry Syllabus

Section-I

1. Atomic Structure:

Heisenberg's uncertainty principle, Schrodinger wave equation (time independent); Interpretation of wave function, particle in one-dimensional box, quantum numbers, hydrogen atom wave functions; Shapes of s, p and d orbitals.

2. Chemical Bonding:

Ionic bond, characteristics of ionic compounds, lattice energy, Born-Haber cycle; covalent bond and its general characteristics, polarities of bonds in molecules and their dipole moments; Valence bond theory, concept of resonance and resonance energy; Molecular orbital theory (LCAO method); bonding in H2+, H2 He2+ to Ne2, NO, HF,CN-, Comparison of valence bond and molecular orbital theories, bond order, bond strength and bond length.

3. Solid State:

Crystal systems; Designation of crystal faces, lattice structures and unit cell; Bragg's law; X-ray diffraction by crystals; Close packing, radius ratio rules, calculation of some limiting radius ratio values; Structures of NaCl, ZnS, CsCl and CaF2; Stoichiometric and nonstoichiometric defects, impurity defects, semi-conductors.

4. The Gaseous State and Transport Phenomenon:

Equation of state for real gases, intermolecular interactions and critical phenomena and liquefaction of gases, Maxwell's distribution of speeds, intermolecular collisions, collisions on the wall and effusion; Thermal conductivity and viscosity of ideal gases.

5. Liquid State:

Kelvin equation; Surface tension and surface energy, wetting and contact angle, interfacial tension and capillary action.

6. Thermodynamics:

Work, heat and internal energy; first law of thermodynamics. Second law of thermodynamics; entropy as a state function, entropy changes in various processes,entropy-reversibility and irreversibility, Free energy functions; Thermodynamic equation of state; Maxwell relations; Temperature, volume and pressure dependence of U, H, A, G, Cp and Cv a and ß; J-T effect and inversion temperature; criteria for equilibrium, relation between equilibrium constant and thermodynamic quantities; Nerns theat theorem, introductory idea of third law of thermodynamics.

7. Phase Equilibria and Solutions:

Clausius-Clapeyron equation; phase diagram for a pure substance; phase equilibria in binary systems, partially miscible liquids-upper and lower critical solution temperatures; partial molar quantities, their significance and determination; excess thermodynamic functions and their determination.

8. Electrochemistry:

Debye-Huckel theory of strong electrolytes and Debye-Huckel limiting Law for various equilibrium and transport properties. Galvanic cells, concentration cells; electrochemical series, measurement of e.m.f. of cells and its applications fuel cells and batteries.Processes at electrodes; double layer at the interface; rate of charge transfer, current density; overpotential; electro-analytical techniques: Polarography, amperometry, ion selective electrodes and their uses.

9. Chemical Kinetics:

Differential and integral rate equations for zeroth, first, second and fractional order reactions; Rate equations involving reverse, parallel, consecutive and chain reactions; branching chain and explosions; effect of temperature and pressure on rate constant; Study of fast reactions by stop-flow and relaxation methods; Collisions and transition state theories.

10. Photochemistry:

Absorption of light; decay of excited state by different routes; photochemical reactions between hydrogen and halogens and their quantum yields.

11. Surface Phenomena and Catalysis:

Absorption from gases and solutions on solid adsorbents, Langmuir and B.E.T. adsorption isotherms; determination of surface area, characteristics and mechanism of reaction on heterogeneous catalysts.

12. Bio-inorganic Chemistry:

Metal ions in biological systems and their role in ion transport across the membranes (molecular mechanism), oxygen-uptake proteins, cytochromes and ferredoxins.

13. Coordination Compounds:

i.Bonding theories of metal complexes; Valence bond theory, crystal field theory and its modifications; applications of theories in the explanation of magnetism and electronic spectra of metal complexes.

ii.Isomerism in coordination compounds; IUPAC nomenclature of coordination compounds; stereochemistry of complexes with 4 and 6 coordination numbers; chelate effect and polynuclear complexes; trans effect and its theories; kinetics of substitution reactions in square-planer complexes; thermodynamic and kinetic stability of complexes.

iii.EAN rule, Synthesis structure and reactivity of metal carbonyls; carboxylate anions, carbonyl hydrides and metal nitrosyl compounds.

iv.Complexes with aromatic systems, synthesis, structure and bonding in metal olefin complexes, alkyne complexes and cyclopentadienyl complexes; coordinative unsaturation, oxidative addition reactions, insertion reactions, fluxional molecules and their characterization; Compounds with metal-metal bonds and metal atom clusters.

14. Main Group Chemistry:

Boranes, borazines, phosphazenes and cyclic phosphazene, silicates and silicones, Interhalogen compounds; Sulphur - nitrogen compounds, noble gas compounds.

15. General Chemistry of 'f' Block Elements:

Lanthanides and actinides; separation, oxidation states, magnetic and spectral properties; lanthanide contraction.

Section-II

1. Delocalised Covalent Bonding:

Aromaticity, anti-aromaticity; annulenes, azulenes, tropolones, fulvenes, sydnones.

2. (i) Reaction Mechanisms: General methods (both kinetic and non-kinetic) of study of mechanism of organic reactions: isotopic method, cross-over experiment, intermediate trapping, stereochemistry; energy of activation; thermodynamic control and kinetic control of reactions.

(ii) Reactive Intermediates: Generation, geometry, stability and reactions of carbonium ions and carbanions, free radicals, carbenes, benzynes and nitrenes.

(iii) Substitution Reactions: SN1, SN2 and SNi mechanisms; neighbouring group participation; electrophilic and nucleophilic reactions of aromatic compounds including heterocyclic compounds-pyrrole, furan, thiophene and indole.

(iv) Elimination Reactions: E1, E2 and E1cb mechanisms; orientation in E2 reactions-Saytzeff and Hoffmann; pyrolytic syn elimination - Chugaev and Cope eliminations.

(v) Addition Reactions: Electrophilic addition to C=C and C=C; nucleophilic addition to C=0, C=N, conjugated olefins and carbonyls.

(vi)Reactions and Rearrangements:

(a) Pinacol-pinacolone, Hoffmann, Beckmann, Baeyer-Villiger, Favorskii, Fries, Claisen, Cope, Stevens and WagnerMeerwein rearrangements.

(b) Aldol condensation, Claisen condensation, Dieckmann, Perkin, Knoevenagel, Witting, Clemmensen, Wolff-Kishner, Cannizzaro and von Richter reactions; Stobbe, benzoin and acyloin condensations; Fischer indole synthesis, Skraup synthesis, Bischler-Napieralski, Sandmeyer, Reimer-Tiemann and Reformatsky reactions.

3. Pericyclic Reactions: Classification and examples; Woodward Hoffmann rules - electro cyclic reactions, cycloaddition reactions [2+2 and 4+2] and sigma tropic shifts [1, 3; 3, 3 and 1, 5] FMO approach.

4. (i) Preparation and Properties of Polymers: Organic polymers-polyethylene, polystyrene, polyvinyl chloride, teflon, nylon, terylene, synthetic and natural rubber.

(ii) Biopolymers: Structure of proteins, DNA and RNA.

5. Synthetic Uses of Reagents: OsO4, HIO4, CrO3, Pb(OAc)4, SeO2, NBS, B2H6, Na- Liquid NH3, LiAlH4, NaBH4, n-BuLi and MCPBA.

6. Photochemistry: Photochemical reactions of simple organic compounds, excited and ground states, singlet and triplet states, Norrish-Type I and Type II reactions.

7. Spectroscopy: Principle and applications in structure elucidation: (i) Rotational: Diatomic molecules; isotopic substitution and rotational constants.

(ii) Vibrational: Diatomic molecules, linear triatomic molecules, specific frequencies of functional groups in polyatomic molecules.

(iii) Electronic: Singlet and triplet states; N.p* and p.p* transitions; application to conjugated double bonds and conjugated carbonyls-Woodward-Fieser rules; Charge transfer spectra.

(iv) Nuclear Magnetic Resonance (1HNMR): Basic principle; chemical shift and spin-spin interaction and coupling constants.

(v) Mass Spectrometry: Parent peak, base peak, metastable peak, McLafferty rearrangement.

Forensic Science Syllabus

Unit – I

Forensic Science: Definitions, History and Development
Crime Scene Management and Investigation; Collection, Preservation, Packing and Forwarding of Physical and Trace evidences for analysis
Legal and Court Procedure pertaining to Expert Testimony

Unit – II

Microscopy: Polarising, Comparison, Stereoscopic, Fluorescent and Electron Microscopes
Spectrophotometry: U. V., Visible, IR atomic absorption
Neutron Activation Analysis
X – rays
NMR
Chromatographic Techniques: TLC, GLC, GCMS, HPLC
Electrophoresis: High and Low voltage electrophoresis, Gel electrophoresis and Immunoelectrophoresis

Unit – III

Fresh blood – Grouping and typing of fresh blood samples including enzyme types
Analysis of stains of blood and allied body fluids for their groups and enzyme tests
Cases of disputed paternity and maternity problems
DNA profiling

Unit – IV

Analysis of illicit liquor including methyl and ethyl alcohol and alcohol in body fluids and breathe
Analysis of petroleum products
Chemical examination and Physiology / Pharmacology of:
Insecticides and Pesticides
Psychotropic Drugs : Sedatives, stimulants, opiates and drugs of abuse
Extraction, Isolation and Identification of Poisons from viscera, tissues and body fluids

Unit – V

Classification of fire arms, ammunition and their compositions
Comparison and Identification of Cartridges, Bullets and Fire arms
Country made fire arms, Velocity, Penetration, Dispersion, Recochet, Accidental Discharge, Determination of Range
Bombs and Explosives : Composition, Ignition, Combustion and Detonation Examination of country made bombs, Improvised Explosive Devices (IEDs).

Unit – VI

Identification of hair, determination of species origin, sex, site and individual identification from hair
Classification and Identification of fibres
Examination and identification of Saliva, Urine, Faecal matter and Milk
Examination and Identification of Semen stains including the species origin and individual characteristics

Unit – VII

Physical analysis of the following: Soil, Glass, Paints, Laquers, Cement, Inks, Paper, Tool marks, Tyre Marks, Shoe Prints, Forensic examination of vehicles in cases of accident

Unit – VIII

Identification of individuals from bodily features Examination and identification of deceased from Skeletal remains Identification and individualization from foot prints Identification and individualization from teeth

Unit – IX

Preliminary examination of documents
Identification of hand – writing, signatures and detection of forgeries
Anonymous and disguised writings
Reproduction of documents through photographic and mechanical means and their examination
Physical and chemical erasures, obliterations, additions, alterations, indentations, secret writings and charred documents
Inks, papers and their scientific examinations including instrumental analysis
Age of documents
Examination of typescripts, printed matter including currency notes and lottery tickets and mechanical impressions
History, classification, search, lifting and examination of fingerprints
Development of latent fingerprints by various methods
Single digit classification and examination of chance prints
Crime records and computerization of fingerprints

Unit – X

Medicolegal aspects of wounds
Post – mortem Examination and PM changes
Asphyxial Death
Sexual offences
Infanticide
Forensic psychiatry and lye detection.

Computer Science and Application Syllabus

1. Discrete Structures

Sets, Relations, Functions, Pigeonhole Principle, Inclusion-Exclusion Principle, Equivalence and Partial Orderings, Elementary Counting Techniques, Probability, Measure(s) for information and Mutual information.

Computability: Models of computation-Finite Automata, Pushdown Automata, Non-determinism and NFA, DPDA and PDAs and Languages accepted by these structures. Grammars, Languages, Non –computability and Examples of non-computable problems.

Graph: Definition, walks, paths, trails, connected graphs, regular and bipartite graphs, cycles and circuits. Tree and rooted tree. Spanning trees, Eccentricity of a vertex radius and diameter of a graph. Central Graphs, Centre(s) of a tree. Hamiltonian and Eulerian graphs, Planar graphs.

Groups: Finite fields and Error correcting/ detecting codes.

2. Computer Arithmetic

Propositional (Boolean) Logic, Predicate Logic, Well-formulae (WFF), satisfiability and Tautology.

Logic Families: TTL, ECL and C-OS gates, Boolean algebra and Minimization of Boolean functions, Flip-flops-types, race condition and comparison. Design of combinational and sequential circuits.

Representation of Integers: Octal, Hex, decimal and Binary, 2's complement and 1's complement arithmetic, Floating point representation.

Combinational Circuit Design, Sequential Circuit Design, Hardwired and Microprogrammed processor design, Instruction formats, Addressing modes, Memory types and organisation, Interfacing peripheral divides, interrupts.

Microprocessor architecture, Instruction set and Programming (8085, P-III/ P-IV), Microprocessor applications.

3. Programming in C and C++

Programing in C: Elements of C- Tokens, identifies, data types in C, Control structures in C, sequence, selection and iteration (s). Structured data types in C-arrays, struct, union, string and pointers.

O-O Programing Concepts: Class, object, instantiation, inheritance, polymorphism and overloading.

C++ Programing: Elements of C++ -Tokens, identifiers, Variables and constants, Date types, Operators, Control statements, Functions parameter passing, Class and objects. Constructors and destructors. Overloading inheritance, Templates, Exception handling.

4. Relational database Design and SQL

E-R diagrams and their transformation to relational design, normalization-1NF, 2NF, 3NF, BCNF and 4NF.Limitations of 4NF and BCNF.

SQL: Data Definition Language (DDL), Data Manipulation Language (DML), Data Control Language (DCL) commands. Database objects like-Views, indexes, sequences, synonymous, data dictionary.

Concurrency and Recovery in Centralised and Distributed Database Systems.

5. Data and File structures

Data, information, Definition of data structure, Arrays, stacks, queues, linked lists, trees, graphs, priority queues and heaps.

File Structures: Fields, records and files, Sequential, direct, index-sequential and relative files, Hashing, inverted lists and multi-lists, B trees and B^+ trees.

Sorting and Searching Algorithms, Analysis of Algorithms, Interpolation and Binary Search, Asymptotic notations-big ohm, omega and theta. Average case analysis of simple programs like finding of a maximum of n elements. Recursion and its systematic removal.

6. Computer networks

Network fundamentals: Local Area Networks (LAN), Metropolitan Area Networks (MAN), E=Wide Area Networks (WAN), Wireless Networks, Inter Networks.

Reference Models: The OSI model, TCP/IP model.
Data communication: channel capacity. Transmission media-twisted pair, coaxial cables, fibre-optic cables, wireless transmission. Telephones-local loop, trunks, multiplexing, switching, narrowband ISDN, broadband ISDN, ATM, High speed LANS. Cellular Radio. Communication satellites-geosynchronous and low-orbit.

Internet working: Switch/Hub, Bridge, Router, Gateways, Concatenated virtual circuits, Tunnelling, Fragmentation, Firewalls.

Routing: Virtual circuits and datagrams. Routing algorithms. Conjestion control.

Network Security: Cryptography-public key, secret key. Domain name System (DNS)-Electronic Mail and Worldwide Web(WWW). The DNS, Resource Records, Name servers. e-mail-architecture and Serves.

7. Operating Systems (with Case study of Unix)

Main functions of operating systems, Multiprogramming, Multiprocessing, and multitasking.

Memory Management: Virtual memory, paging, fragmentation.
Concurrent Processing: Mutual exclusion, Critical regions, lock and unlock.

Scheduling: CPU scheduling, I/O scheduling, Resource scheduling, deadlock and scheduling algorithms. Banker's algorithm for deadlock handling.

UNIX

The Unix System: File system, process management, bourne shell, shell variables, command line programming.

Filters and Commands: Pr, head, tail, cut, paste, sort, uniq, tr, join, etc., grep, egrep, etc., sed, awk, etc.

System Calls(like): Creat, open, close, read, write, iseek, link, unlink, stat, fstat, umask, chmod, exec, fork, wait, system.

8. Software Engineering

System Development Life Cycles (SDLC): Steps, Water fall model, Prototypes, Spiral model.

Software Metrics: Software Project Management.
Software Design: System design, detailed design, function oriented design, object oriented design, user interface design. Design level metrics.

Coding and Testing: Testing level metrics. Software quality and reliability. Clean room approach, software reengineering.

9. Current Trends and Technologies

Parallel Computing

Parallel virtual machine (pvm) and message passing interface (mpl) libraries and calls. Advanced architectures. Today's fastest computers.

Mobile Computing

Mobile connectivity-Cells, Framework, wireless delivery technology and switching methods, mobile information access devices, mobile data internetworking standards, cellular data communication protocols, mobile computing applications. Mobile databases-protocols, scope, tools and technology. M-Business.

E-Technologies

Electronic Commerce: Framework, Media Convergence of Applications, consumer applications, Organisation Applications.

Electronic payment Systems: Digital Token, Smart Cards, Credit Cards, Risks in Electronic Payment system, Designing Electronic Payment Systems.

Electronic Data Interchange (EDI): Concepts, Applications, (Legal, security and Privacy) issues, EDI and Electronic Commerce, Standardization and EDI, EDI Software Implementation, EDI Envelope for Message Transport, internet-Based EDI.

Digital Libraries and Data Warehousing: Concepts, Types of Digital documents, Issues behind document Infrastructure, Corporate Data Warehouses.

Software Agents: Characteristics and Properties of Agents, Technology behind Software Agents (Applets, Browsers and Software Agents).

Broadband Telecommunications: Concepts, Frame Relay, Cell Relay, Switched Multimegabit Data Service, asynchronous Transfer Mode.

Main concepts in Geographical information System(GIS), E-Cash, E-Business, ERP packages.

Data Warehousing: Data Warehouse environment, architecture of a data warehouse methodology, analysis, design, construction and administration.

Data Mining: Extracting models and patterns from large databases, data mining techniques, classification, regression, clustering, summarization, dependency modelling, link analysis, sequencing analysis, mining scientific and business data.

10. Programming language concepts, paradigms and models.

Data, Data types, Operators, Expressions, Assignment. Flow of Control-Control structures, I/O statements, User-defined and built-in functions, Parameter passing.

Principles, classes, inheritance, class hierarchies, polymorphism, dynamic binding, reference semantics and their implementation.

Principles, functions, lists, types and polymorphisms, higher order functions, lazy evaluation, equations and pattern matching.

Principles, horn clauses and their execution, logical variables, relations, data structures, controlling the search order, program development in prolog, implementation of prolog, example programs in prolog.

Principles of parallelism, coroutines, communication and execution. Parallel Virtual machine (PVM) and Message Passing interface (MPI) routines and calls. Parallel programs in PVM paradigm as well as MPI paradigm for simple problems like matrix multiplication.

Computer structure, compiler construction tools, compilation phases.

Finite Automata, Pushdown Automata. Non-determinism and NFA, DPDA, and PDAs and languages accepted by these structures. Grammars, Languages-types of grammars-type 0, type 1, type 2, and type 3. The relationship between types of Grammars, and finite machines. Pushdown automata and Context Free Grammars, Lexical analysis-regular expressions and regular languages. LEX package on Unix, Conversion of NFA to DFA. Minimizing the number of states in a DFA. Compilation and Interpretation. Bootstrap compilers.

Context free grammars, Parsing and parse trees. Representation of parse (derivation) trees as rightmost and leftmost derivations. Bottom up parsers. Predictive parser, Intermediate codes-Quadruples, triples. Intermediate code generation, code generation, code optimization.

Forensic Chemistry Syllabus

Unit –I

Analysis of Alcoholic & Non- alcoholic beverages: Analysis of various types of denaturants of alcohols, country made liquor, illicit liquor, medicinal preparations and liquor of forensic importance as per BIS specifications, by colour test and Instrumental technique.
Petroleum products and their adulterations: Chemical composition of various fractions of Petroleum Products, Marketing Disciplinary Guidelines for sampling of petrol and diesel. Analysis of petrol, kerosene, diesel, lubricants by BIS methods and ASTM methods. Detection of adulterants of Gasoline, Diesel and Engine oils. Analysis of adulterants in forensic exhibits by Gas Chromatography, Analysis of dyes of Petrol, Kerosene and Engine oils. Essential Commodity Act & Petroleum Act.

Unit-II

Analysis of Milk product: Detection of adulterants in milk and milk products by physical, chemical and instrumental techniques.
Oils and Fats: Chemical composition and analysis of different common oils and their adulterants by physical, chemical and instrumental technique
Bride burning cases and acid attack cases: Evidence collection and analysis
Analysis of trap case: Mechanism of colour reaction, factor affecting the colour, detection of phenolphthalein and alkali used, method of detection of colourless solution by TLC and UV visible spectrophotometer.
Dyes: Classification of dyes, their uses in fiber and pharmaceutical industries
Chemical analysis and Instrumental methods of analysis.

Unit- III

Fire and Arson: Extraction of fire accelerants from fire debris, advantages and their limitations. Methods and techniques used in identification of fire accelerant, Analysis of fire accelerants by UV visible spectrophotometry, TLC and Gas Chromatography-Head space.
Explosives &Explosions: Different types of explosives, their chemical structure. Atomic explosion, Physical explosion, Chemical explosion, Explosion and its effects, Type of hazards, Effect of blast wave on structures and humans. IEDs and firing mechanisms of IEDs.
Collection of samples, Methods for extraction of explosive from post blast material/ debris, Qualitative analysis of explosives and explosion residue by preliminary analysis and Instrumental techniques.

Unit- IV

Chemical warfare agents: Classification, physical and chemical properties, toxic effects, detections and protection.
Metals and Alloys: Scope & Significance of metal and alloy analysis in forensic science. Identification & composition of metals and alloys, purity of metals including precious metals such as gold, silver and platinum. Different types of metals and alloys commonly encountered for forensic analysis. Hall marking of precious metal according to BIS.

Unit-V

Toxicology: Commonly encountered poisons in cases of poisoning in India. Shelf life of poisons. Detection of drugs and their metabolites on the spot in body fluids and tissues.
Plant Poisons: Introduction, classification, identification by microscopic technique, colour test, thin layer chromatography and other instrumental techniques.
Animal Poisons: Commonly encountered animal poisons in India. Snake venom active constituents of snake venom, collection of samples for analysis, pharmacological action on human body, Analysis of snake venom by precipitin test.
Water Soluble Drugs/ Poisons- Pharmacological action, problems associated with extraction from pharmaceutical products and biological material. Method of extraction using Ion pair (drug –dye complexometry). Isolation and Identification by TLC, and UV Visible spectrophotometry.
Ptomaines: Introduction, interference caused in analysis of poison, especially in putrefied viscera, poisoning due to ptomaines.

Unit VI

Methods of Extraction- Classification of matrices: biological and non-biological matrices. Modern methods of Extraction: Solid phase extraction, solid phase micro extraction. Different methods of extraction for volatile and non-volatile poisons: Solvent extraction and isolation, distillation /steam distillation, micro diffusion, dialysis, dry ash, wet digestion. Extraction of poison by stas-otto method, ammonium sulfate method from viscera, blood, urine, stomach wash and vomit, cold drink, food material and from other matrices of forensic importance.

Unit VII

Pharmacology of Forensic Drugs & Poisons: Studies on absorption, distribution, pharmacokinetics, metabolism pathways of common drugs and poisons, Drug toxicity, excretion of drugs and poisons.
Study of Metabolites of methanol and ethanol, acetyl salicylate, DDT, Parathion, Pentothal, carbaryl, phenobarbitone, diazepam, amphetamine and heroin, ketamine. Identification of the drugs & their metabolites by GC-Mass & LC-Mass.

Unit VII

Analysis of Gases and volatile poisons: Alcohols, aldehydes, ketones, hydrocyanic acid, chlorinated hydrocarbon, benzene nitrobenzene, turpentine, carbon dioxide, carbon monoxide, ammonia, phosphine, sulfur dioxide, hydrogen sulphide, chlorine in Biological fluids.
Heavy metal poison and their Chemical Analysis (Arsenic, antimony, mercury, bismuth).
Analysis of pesticides: Organochloro, organophosphorous, carbamates and synthetic pyrethroids.
Method of analysis of acidic/ basic/ neutral drugs in viscera
Toxicological findings- Significance of analytical studies with forensic examination, interpretation of toxicological finding and preparation of reports, toxicological analysis of decomposed materials.

Unit-IX

Scope and significance of the analysis of controlled substances in forensic science, Classification of NDPS Drugs and their characterization.
NDPS Act- Relevant Sections
Drug dependence, drug addiction and its problems.

Unit-X

Analysis of Narcotic Drugs: opium and its major alkaloids, heroin and other synthetic narcotics.
Analysis of Psychotropic substances: Barbiturates, methaqualone, benzodiazepines, and Z- drugs.
Analysis of Stimulants: Cocaine and amphetamines and ephedrine, pseudoephedrine, mephedrone related derivatives and cathinone.
Analysis of Hallucinogens: Ganja, hashish (Charas), LSD, Mushroom and cactus.

Define precursor, commonly encounter precursors of NDPS drugs, Search of clandestine laboratory, precursors and their analysis
Analysis of Designer drugs, club drugs, date rape drugs by Field test, colour test, micro crystal test, thin layer chromatography.
Analysis of NDPS drugs in biological samples and their importance, methods of extraction of drugs from urine, blood, and saliva.
Excretion of drugs through hairs and nail and their examination. Procedure for collection, of hair sample, storage preservation. Method of extraction of drugs from hair and nails and their identification using instrumental techniques.

Unit-XI

Confirmation of drugs through instrumental techniques: Analysis of Narcotic drugs, depressants, tranquillizers, stimulants, hallucinogens, club drugs & other drugs of abuse through High Performance Thin Layer Chromatography, Gas liquid chromatography, High Pressure liquid chromatography, , UV-visible spectrometry, IR/FTIR and Raman spectroscopy, Mass Spectrometry, GC-Mass and LC-Mass, HPTLC-Mass. Method validation and calibration of instruments.

Unit-XII

Detection of adulterants: NDPS drugs and their commonly encountered adulterant. Determination of nature of adulterant, diluent, and additives.
Percentage purity determination: Estimation of % purity of the NDPS drugs and detection in seized samples such as opium charas, amphetamine, cocaine, and tranquilizers in seized sample
Reporting of cases and court testimony: Laboratories authorized to conduct examination an expert authorized to report NDPS substances, Limitation of chemical analysis of drugs. Report writing and interpretation of drugs analysis. Court testimony in NDPS Act cases. Case studies and ground for acquittal. Moot Court.

Unit-XIII Molecular Spectroscopy

Ultra violet and visible spectroscopy: Qualitative discussion of molecular binding, molecular orbital, types of molecular energies, qualitative discussions of rotational, vibrational and electronic spectra, spectra of polyatomic molecules.
Effect of Chemical Structure and solvent on absorption spectra, qualitative and quantitative analysis and limitations. Applications in forensic chemistry and toxicology.

Infrared spectrophotometry: Basic principle, components, Sample handling, Dispersive and Fourier transform spectrophotometry, (FTIR). Qualitative analysis and interpretation of IR spectra, correlation of infrared spectra with molecular structure and applications in forensic chemistry and toxicology.
Raman Spectroscopy: Basic principles, Instrumentation, sample handling and illumination, structural analysis, polarization measurements and Dispersive & FT analysis and Applications in Forensic Chemistry and Toxicology. Advantage of Raman over IR and vice versa, Role of microscope.

Unit XIV Atomic Spectroscopy

Atomic Absorption Spectroscopy (AAS): Instrumentation, interference in AAS, background correction methods, graphite furnace quantitative analysis and applications. Detection limit and sensitivity.
Atomic Emission Spectroscopy (AES): Instrumentation and techniques, arc/spark emission, ICP-AES, comparison of ICP vs AAS methods, quantitative analysis, ESCA and its applications.
Fluorescence and phosphorescence spectroscopy: Types of sources, structural factors, instrumentation, comparison of luminescence and UV-visible absorption methods and applications. Nuclear Magnetic Resonance Spectroscopy: Basic principles, theory and Instrumentation and applications.

Unit-XV Chromatographic Techniques

General principles of Adsorption chromatography, partition chromatography, Size Exclusion (permeation) chromatography, Affinity chromatography. Ion-exchange chromatography, Capillary Chromatography, column chromatography Gas Chromatography: Gas solid chromatography, Ga Gas-liquid chromatography, types of columns, types of detectors used. Advantages and Limitations of different Detectors, GC-HS. Applications of GC in forensic chemistry & toxicology.
High Performance Liquid Chromatography: Basics of LC, types of columns and stationary phase, mobile phase, column conditioning, types of detectors, interpretation of chromatogram. Application of HPLC in Forensic chemistry and toxicology. Limitations and Advantages of HPLC over GC. Basics of HPTLC and their applications in Forensic chemistry and Toxicology.

Unit-XVI Spectrometric Techniques:
Elements of X-ray spectrometry: X-ray absorption and fluorescence, Energy Dispersive X-ray Analysis (EDX), wavelength Dispersive X-ray analysis (WDX), X-ray diffraction, Auger emission spectroscopy and applications.
Basics of Mass Spectrometry: Sample flow, Different Ionization methods-chemical ionization, electron spray ionization, Tandem mass spectrometry

Vacuum systems, Mass analyser, Ion Microprobe Mass Analyser (IMMA), Data handling, Correlation of mass spectra and molecular structure.

Applications of Mass Spectrometry in Forensic Chemistry and Forensic Toxicology.

Hyphenated techniques: Gas Chromatography coupled with FTIR, Gas Chromatography coupled with mass spectrometry (GC-MS), Liquid Chromatography coupled with mass spectrometry (LC-MS), Fourier transform mass spectrometry (FTIR-MS), Inductively coupled plasma MS (ICP-MS), High Performance Thin Layer Chromatography coupled with Mass spectrometry (HPTLC-MS)

Applications of Hyphenated techniques in Forensic Chemistry and Toxicology.

ANNEXURE B/2

Cyber Forensics Syllabus

Unit I – Analysis of Digital Evidences
Rules and Services of Digital Forensics, Daubert Standards, Locard"s Principle of Exchange in Digital Forensic. ISO/IEC 27037: 2012.
Forensics Investigation Process- Pre-search consideration, Collection of Evidences from crime scene, Acquisition, Duplication & Preservation of evidences, Examination and Analysis of evidences, Storing of Evidences, Documentation and Reporting, Maintaining the Chain of Custody. Hashing and its importance. Understanding Storage Formats for Digital Evidences – Raw Format, Proprietary Formats, Advanced Forensic Formats. Data Acquisition of live system, Shutdown Systems and Remote systems. Digital Forensics Standard Operating Procedures. Software and Hardware Tools used in Forensic Analysis – Open Source and Proprietary tools. Challenges and issues in Cyber-crime investigation and Digital forensics.

Unit II –Windows Forensics
Windows Systems Artifacts: File Systems, Registry, Event logs, Shortcut files, Executables. Alternate Data Streams (ADS), Hidden files, Slack Space, Disk Encryption, Windows registry, startup tasks. Forensic Analysis of the Registry – Use of registry viewers, Regedit. Extracting USB related artifacts and examination of protected storages. Email investigations. Data recovery – Tools and techniques. Malware Analysis.

Unit III –Linux and Mac Forensics
Linux system and Artifacts – Use of built-in command line tools for forensic investigation – dd, dcfldd, fdisk, mkfs, mount, unmount, md5sum, sha1sum, dmseg; Ownership and Permissions, Hidden files, User Accounts and Logs. Mounting of hard disk having forensic image, Use of „FIND" command for searching and timeline analysis of files.
Mac OS system and Artifacts - System startup and services, Hidden directories, System Logs and user Artifacts.

Unit IV – Cloud and IoT Forensics
Introduction to Cloud Technology and its various components, Cloud Security Architecture, Secure Cloud based service, Identity and Access Management, Encryption and Key Management. Cloud Forensic Challenges.
Technical Dimension- Data Collection, Live Forensics, Evidence Segregation, virtualized environments and proactive measures. Organizational Dimension- Internal staffing, External Dependency Chains, Service Level Agreement, Multiple Jurisdictions and Tenancy. Investigative tools in the virtualized environment. Analysis- correlation, reconstruction, time synchronization, logs, metadata, timelines.

Unit V – Overview of Networking
Introduction to Network and Communication technologies – Overview of OSI Model and TCP/IP Protocol. IP Addressing and NAT. Types of IP addresses. IP Addressing Classes, Subnet Masks, Subnetting and Supernetting. Network Topologies. Network Devices – hubs, switches, bridges, repeaters, routers etc. Types of Networks – LAN, MAN and WAN. Routers and Routing Protocols.

Unit VI – Threats, Vulnerabilities and Attacks
Network threats and vulnerabilities, Types of network attacks- eavesdropping, spoofing, modification, Cross-site scripting, DNS Spoofing, Routing Table Poisoning, ARP Poisoning, Web Jacking. Phases of Hacking and Detection – Reconnaissance Phase, Passive Attacks, Active Attacks, Detection Avoidance Phase, Evading anti viruses and firewalls, Tools used; Attacks on Wireless Networks. Social Engineering Attacks and its types.

Unit VII – Network Security
IP security architecture, Security protocols, IPSec, Web Security – Firewalls, IDS, IDPS – Types and Technologies. Trusted systems – Electronic payment protocols. Network Security Applications, Authentication Mechanisms: Passwords, Cryptographic authentication protocol, Kerberos, X.509 LDAP Directory. Digital Signatures. Web Security: SSL Encryption, TLS, SET. Intrusion detection. Securing online payments (OTP). Virtual private networks.

Unit VIII – Network Forensics
Monitoring of computer network and activities, Live Packet Capturing and Analysis. Searching and collection of evidences from the network. Network Intrusion Detection and Analysis. SQL Injection, Event Log Aggregation – role of
logs in forensic analysis, tools and techniques. Investigating network attacks. Evidence collection from Routers & CCTV DVRs.

Unit IX – Introduction to Mobile and Wireless Technologies
Asynchronous Transfer Mode (ATM), Wireless Application Protocol (WAP). Cellular technologies including Advanced Mobile Phone System (AMPS), Imode, Time Division Multiple Access (TDMA), Code Division Multiple Access (CDMA) and Global System for Mobile Communications (GSM) including features and relative strengths. Functions of Subscriber Identity Module (SIM), International Mobile Equipment Identity (IMEI), Bluetooth and Mobile Payment Gateways. Understanding of the mobile phone operating systems – Android, iOS, Windows.

Unit X – Mobile and Wireless Devices Security
Security issues in Bluetooth, Mobile phones including SIM cloning and other Bluetooth vulnerabilities. Attacks - Denial of Service (DOS), Packet Spoofing & Masquerading, Eavesdropping, VOIP Spam and Vishing (VOIP Phishing), Toll frauds, Phone Phreaking, Call tampering, Wireless Hack Walkthrough and Man-in-the-Middle-attacks. Overview of WEP attack. Attacks on WEP, WPA and WPA-2 Encryption, fake hotspots.
Wireless Public Key Infrastructure. Securing WLAN, WEP Decryption script, Understanding of SQLite Databases. Voice, SMS and Identification Data Interception in GSM. SMS security issues – Availability, Confidentiality and Integrity issues.

Unit XI – Overview of Mobile Forensics
Mobile Forensic, Types of Evidence present in mobile phones - Files present in SIM card, external memory dump, and evidences in memory card. Seizure and Preservation of mobile phones and PDA. Mobile phone evidence extraction process, Data Acquisition Methods – Physical, File System, Logical and Manual Acquisition. Good Forensic Practices, Mobile Forensic Investigation Toolkit. Tracking of mobile phone location. Challenges to Mobile forensics.

Unit XII – Android and iOS Device Forensics

Android Forensics – Procedures for handling android device, imaging android USB mass storage devices, Logical and physical data extraction techniques. Data recovery techniques. Forensic tools used. CDR and IPDR analysis. iOS Forensics – File Systems, iOS architecture, Data stored in iPhones, Cross-contamination and Syncing, Data extraction - Extracting Image Geo-Tags, Data Analysis and Recovery - SQLite databases, Forensic Tools used.

Unit XIII

The World Wide Web, Web Centric Business, e-Business Architecture, Models of e-Business, e-Commerce, Threats to virtual world. Cyber Crimes- Cyber Squatting, Cyber Espionage, Cyber Warfare, Cyber Terrorism, Cyber Defamation. Social Media-Online Safety for women and children, Misuse of individual information. IT Act 2000 - Objectives, Applicability, Non-applicability, Definitions, Amendments and Limitations.

Unit XIV

Digital Signature and its legal recognition, e-signature, Electronic Records and their legal recognition, Electronic Evidence. Electronic Governance. Controller, Certifying Authorities, Cyber Regulation Appellate Tribunal (Rules announced under the Act). Data Security, E Contracts and E Forms.

Unit XV

Information Technology (Amendment) Act 2008 – Objective, Applicability and Jurisdiction; Various cyber-crimes under Sections 43 (a) to (j), 43A, 65, 66, 66A to 66F, 67, 67A, 67B, 70, 70A, 70B, 80 etc. along with respective penalties, punishment and fines. Penal Provisions for Phishing, Spam, Virus, Worms, Malware, Hacking, Trespass and Stalking; Human rights in cyberspace, International Co-operation in investigating cybercrimes. Relevant Sections of Indian Evidence Act and Banker"s Book Evidence Act.

Unit XVI

Introduction to Intellectual Property Rights, Conventions and Treaties relating to Global Administration of IPR, Jurisdiction Enforcement and Administration of IPRs, Law of Intellectual Property and Ethical Issues, IPR in India and Abroad, Introduction to Copyrights as forms of Intellectual Property, Intellectual Property Issues in Cyber Space – Interface with Copyright Law, Trademarks & Domain Names Related Issues, Metatags, Linking, Framing, Adwords and Trademark Infringement.

Annexure B/3

Forensic Photography syllabus

Principles of Photography: Fundamentals of light and vision, light source, geometry and photometry of image formation, types of camera (SLR & DSLR), features, camera movement, exposing, & printing

Digital photography: Principles of digital photography, software for digital photography, file formats-jpg, gif, bmp, tiff, raw etc., digital watermarking, digital imaging, use of optical filters, photogrammetry, radiography, photomicrography, microphotography.

Specialized photography- close-up, midrange and bird-eye view photography, indoor and outdoor photography, aerial photography, High-speed photography, aperture and focus adjustment

UV, IR, close up, transmitted light, side light, trick photography, contact print photography, oblique light photography, Faro technology for 3D documentation of crime scene.

Radiography, microphotography, photography using scientific equipment.

Videography-basics of video camera and their function, video standard formats, application of videography in forensic science. CCTV image enhancement, processing of digital images and its manipulation.

Scope of photography in various disciplines of forensic science- finger prints, foot prints, physics, chemistry, biology, ballistics, computer forensics, crime scene etc.

Preparation of demonstrative images and juxta pose charts, use of photography in reconstructing the scene of crime and its presentation in the court of law.

Legel aspect: Laws relating to digital evidence and its admissibility.